Dataset Description	
Dataset Title	**NCCOS Assessment: Benthic Habitat Maps of Saipan Lagoon, Commonwealth of the Northern Mariana Islands**
Short Title	NCCOS Saipan Lagoon Mapping
Abstract	The lagoon along the western shore of Saipan encompasses a diverse coral ecosystem that plays a leading role in attracting nearly half a million tourists annually for snorkeling, diving, parasailing, kayaking, and use of personal watercraft. Understanding the present spatial distribution of valuable lagoon habitats is needed to evaluate zoning scenarios, minimize user conflicts, ensure public safety, and prevent environmental degradation inside the Lagoon. The main objective of this project was to support these decisions by producing new, highly detailed maps of benthic habitats within the Lagoon. This data collection includes the information used to create these detailed maps, including: 1) a high resolution satellite image, 2) depths derived from this satellite image, 3) *in situ* habitat information, 4) 12 predictions describing the probability of occurrence for five substrate and seven biological cover types, and 5) a composite habitat map showing the spatial distribution of seven commonly co-occurring substrate and biological cover types inside the lagoon. The performance and accuracy of these predictions and maps were evaluated by local experts and using an independent dataset. The performance of the predictions was considered “good to excellent” since they had little bias (mean = 2% ± 1% SE) and explained over a third of the variation in the data (mean percent deviance explained = 33.0% ±4.8 SE). The overall thematic accuracy of the composite map was 86% with user’s accuracy of individual habitat classes between 80% and 100% correct. These accuracies are similar to the other benthic habitat maps created by NOAA NCCOS in the Pacific Region. Consequently, these products can be used with confidence for a variety of research and management applications, including inform the process to update the Saipan Lagoon Use Management Plan (SLUMP). Products from this assessment may also support coastal and ocean management efforts by other territorial and federal agencies working in Saipan, CNMI. Keywords: Benthic habitats; Benthic substrate; Benthic biological cover; Geographical Distribution; Mathematical Models; Commonwealth of the Northern Mariana Islands; CNMI; Saipan; Saipan Lagoon
Purpose	CNMI’s Bureau of Environmental and Coastal Quality (BECQ) and NOAA’s Pacific Islands Regional Office (PIRO) partnered with NOAA's National Centers for Coastal Ocean Science (NCCOS) to develop updated habitat maps and assess habitat changes in Saipan Lagoon,CNMI. NCCOS developed these spatially resolved maps using environmental predictors, underwater videos/photos and mathematical modeling techniques. The new maps were designed to inform the Saipan Lagoon Use Management Plan (SLUMP), which is being updated in response to changes in lagoon habitats, user activities, and increases in tourism. Understanding the present spatial distribution of benthic habitats is an important part of the Territorial Government’s process to evaluate zoning scenarios, minimize user conflicts, ensure public safety, and prevent environmental degradation inside the lagoon. Products from this assessment may also support coastal and ocean management efforts by other territorial and federal agencies working in Saipan. This work was funded by NOAA Coral Reef Conservation Program (CRCP Project #31100).
Methods	Several processes were used to map and evaluate changes in habitats inside Saipan Lagoon. First, we describe the steps used during map development, including: customizing a habitat classification scheme; processing environmental variables including satellite, topographic, and geographic predictors; collecting underwater video data; and creating habitat predictions using two modeling techniques called Boosted Regression Trees (BRTs) and Boosted Classification Trees (BCTs). Next, we describe the independent dataset and process used to assess the performance and accuracy of the habitat models. Last, we explain the methods used to quantify changes in habitat distributions throughout the Lagoon and to highlight habitat shifts apparent between the 2001 and 2016 satellite images. Please see the following publication for more details: Kendall *et al.* (2017).
Cited Publications	Kendall, M., B. Costa, S. McKagan, L. Johnston, and D. Okano. 2017. Benthic Habitat Maps of Saipan Lagoon. NOAA Technical Memorandum NOS NCCOS 229. Silver Spring, MD. 79 pp. NOAA NCCOS (National Centers for Coastal Ocean Science). 2005. Atlas of the Shallow-Water Benthic Habitats of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. NOAA Technical Memorandum NOS NCCOS 8. Silver Spring, MD. 126 pp. Online: https://products.coastalscience.noaa.gov/collections/benthic/e99us_pac/ (Accessed 16 February 2017). NOAA NCCOS (National Centers for Coastal Ocean Science). 2005. Atlas of the Shallow-Water Benthic Habitats of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands; CNMI – Data; Saipan; GPS Control Points (ZIP, 11 KB), Image Mosaics (ZIP, 41.2KB). Data downloaded 5 March 2016. Data Website: https://products.coastalscience.noaa.gov/collections/benthic/e99us_pac/data_c

	nmi.aspx (Site Accessed 21 February 2017). NOAA NCCOS (National Centers for Coastal Ocean Science). 2005. Atlas of the Shallow-Water Benthic Habitats of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands; CNMI – Data; Saipan; Habitat Shapefiles (ZIP, 1.3MB), Shoreline Shapefiles (ZIP, 46KB), GPS Control Points (ZIP, 11 KB), Image Mosaics (ZIP, 41.2KB). Data downloaded 5 March 2016. Data Website: https://products.coastalscience.noaa.gov/collections/benthic/e99us_pac/data_cnmi.aspx (Site Accessed 21 February 2017). USACE (U.S. Army Corps of Engineers). 2007. 2007 USACE Lidar: Pacific Islands (Saipan). Data downloaded 5 March, 2016. Data Website: https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=561/details/561 (Accessed 21 February, 2016).
Project Webpages	"Mapping Habitat Change in Saipan Lagoon, CNMI" https://coastalscience.noaa.gov/projects/detail?key=271
Web Services	"Saipan Lagoon BIOMapper" https://maps.coastalscience.noaa.gov/biomapper/biomapper.html?id=Saipan

People & Projects	
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NCCOS Funding	US DOC; NOAA; NOS; National Centers for Coastal Ocean Science (NCCOS)
Other Funding	US DOC; NOAA; NOS; Coral Reef Conservation Program (CRCP)
Partner Entity	US DOC; National Oceanic and Atmospheric Administration (NOAA); National Marine Fisheries Service (NMFS); Pacific Islands Regional Office (PIRO), Habitat Conservation Division Commonwealth of the Northern Mariana Islands (CNMI), Bureau of Environmental and Coastal Quality (BECQ)
NCCOS Project	NCCOS Project #271, "Mapping Habitat Change in Saipan Lagoon, CNMI"
Other Projects	CRCP Project #31100, "Mapping Habitat Change in Saipan Lagoon, CNMI"
Resource Provider	*NCCOS Data Manager <nccos.data@noaa.gov>*
Comment	*This data documentation describes numerous geospatial datasets archived together as a NOAA NCEI data collection, and is intended to provide dataset-level metadata for the purposes of discovery, use, and understanding.*
Use Limitation	*Please note: NOAA makes no warranty, expressed or implied, regarding these data, nor does the fact of distribution constitute such a warranty. NOAA cannot assume liability for any damages caused by any errors or omissions in these data.*

Dates, Locations, and Keywords	
Start Date	2016-02-05
End Date	2016-08-09
Northern Boundary	15.308
Southern Boundary	15.062
Western Boundary	145.676
Eastern Boundary	145.839
Sea Areas or Regions	Western Pacific Commonwealth of the Northern Mariana Islands (CNMI)

	Saipan Saipan Lagoon
Marine Protected Areas	Mañagaha Marine Conservation District Lighthouse Reef Trochus Sanctuary
NCCOS Research Priorities	Marine Spatial Ecology (MSE)
NCCOS Research Topics	Ecological/Biological Characterization Predictive/Spatial Modeling
NCCOS Regions	U.S. Pacific
U.S. States and Territories	Commonwealth of the Northern Mariana Islands (CNMI)
NCCOS Geographic Areas	Coral Reefs Coastal Ocean Continental Shelf
NCCOS Research Data Types	Geospatial Model Derived Data Product
ISO Topic Categories	geoscientificInformation oceans environment biota
CoRIS Keywords	Place: COUNTRY/TERRITORY > Northern Mariana Islands > Saipan > Saipan Island (15N145E0002) OCEAN BASIN > Pacific Ocean > Western Pacific Ocean > Saipan Island > Saipan Island (15N145E0002) Discovery: Geographic Information > Habitats Map Images > Bathymetry Map Images > Coral Mapping Map Images > Habitats Map Images > IKONOS Map Images > Topography Numeric Data Sets > Benthic Visual Images > Habitats Visual Images > Corals Visual Images > Seagrass Theme: EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Mapping > Habitat Mapping EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Mapping > Base map > Satellite Imagery EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Remote Sensing > Satellite (digital scans) > Multispectral Analysis EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Remote Sensing > Satellite (digital scans) > WorldView-2 EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Bathymetry EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Rugosity EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Slope EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Water Depth EARTH SCIENCE > Biosphere > Aquatic Habitat > Benthic Habitat EARTH SCIENCE > Biosphere > Aquatic Habitat > Reef Habitat EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Hard Seafloor Substrate EARTH SCIENCE > Oceans > Bathymetry/Seafloor Topography > Soft Seafloor Substrate EARTH SCIENCE > Biosphere > Zoology > Corals EARTH SCIENCE > Biosphere > Zoology > Corals > ESA Listed Species EARTH SCIENCE > Oceans > Marine Biology > Marine Plants > Seagrass EARTH SCIENCE > Biosphere > Vegetation > Algae > Algae Cover EARTH SCIENCE > Biosphere > Vegetation > Algae > Calcareous Macroalgae EARTH SCIENCE > Biosphere > Vegetation > Algae > Crustose Coralline Algae EARTH SCIENCE > Biosphere > Vegetation > Algae > Fleshy Macroalgae EARTH SCIENCE > Biosphere > Vegetation > Algae > Turf Algae

	EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Benthos Analysis EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > In Situ Biological EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > In Situ Physical EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Photographic Analysis EARTH SCIENCE > Biosphere > Zoology > Corals > Reef Monitoring and Assessment > Photographic Analysis > Videography

Parameter Description	
Parameters or Variables	Benthic Habitat Type
Property Type	Calculated
Units	n/a
Observation Category	model output
Sampling Instrument	documentation only - no instrument type
Sampling and Analyzing Method	The probability of occurrence for five substrate and seven cover types were predicted using a satellite image, underwater videos and boosted regression trees. Bootstrapping was used to estimate the precision of these predictions. A composite habitat map was created from these predictions using boosted classification trees. The performance and accuracy of these predictions and map were evaluated using an independent dataset. Please see the following publication for more details: Kendall *et al*. (2017).
Data Quality Method	Substrate and cover predictions and the composite habitat map were reviewed and accepted by local subject matter experts and resource managers in Saipan, CNMI. The performance of these predictions and the accuracy of this habitat map were also assessed using an independent dataset. Please see the following publication for more details: Kendall *et al*. (2017).

Complete list of datasets included in this collection:

A. Imagery:
   1. Digital Elevation Model
   2. Ground Control Points
   3. Satellite Images

B. Accuracy Assessment and Ground Validation:
   1. Underwater Photographs (Available upon request by contacting Matt Kendall, Matt.Kendall@noaa.gov).
   2. Underwater Videos (Available for viewing and downloading at: https://maps.coastalscience.noaa.gov/biomapper/biomapper.html?id=Saipan)
   3. Accuracy Assessment
   4. Ground Validation

C. Environmental Predictors:
   1. Geographic Predictors
   2. Seafloor Topography Predictors
   3. Spectral Predictors

D. Habitat Prediction Maps:
   1. Cover
   2. Substrate
   3. Composite Habitat Map

See separate data documentation files:

Saipan-Lagoon-Mapping_Data-Documentation_A_Imagery.pdf
Saipan-Lagoon-Mapping_Data-Documentation_B_Accuracy-Assessment-and-Ground-Validation.pdf
Saipan-Lagoon-Mapping_Data-Documentation_C_Environmental-Predictors.pdf
Saipan-Lagoon-Mapping_Data-Documentation_D_Habitat-Prediction-Maps.pdf